that it is merely a deformed example of the common Brazilian species.

1. The specimen, although fully adult, is not very old, having still reddish-brown cross bars on the outer web of the inner primaries. The state of its wing- and tail-feathers shows clearly that it has been kept in captivity.

2. The head, body, and toes are of the same dimensions as in normally developed individuals; but the tarsus, which in an old bird measures normally $7\frac{1}{4}$ inches*, is reduced in our specimen to $5\frac{1}{4}$ inches, the number of anterior transverse scutes being the same in both (26 or 27). The bone is slightly bent inwards, thus showing unmistakable signs of being malformed by rhachitic disease. Also the tibia appears to be somewhat shortened.

3. The shortness of the neck can be accounted for by the manipulation of the stuffer; but I must remark that in the skeleton of another specimen likewise kept in captivity, the eleventh and twelfth cervical vertebræ are affected by rhachitis; so that in our stuffed example the shortness of the neck may have been really caused by an abnormal curvature of the cervical portion of the vertebral column. In the skeleton mentioned the upper end of the right tibia and the first phalanx of the outer toe of the same side are much swollen in consequence of osteoporosis.

4. In the plumage not the slightest difference can be observed between this and other specimens of *C. cristata* of the same age.

It will be seen from these remarks that the Cariama, which is easily domesticated and frequently kept in captivity, is, in this state, subject to diseases of the bones, and that bodies of tame birds should not be chosen for osteological preparations.

On the Natural Affinities of the Balistidæ.

By M. C. Dareste.

In a memoir published in 1851 I showed that the Cuvierian order Plectognathi contains a certain number of very dissimilar forms united by a very imperfect character—that it must, consequently, be struck out of our classification, as M. Vogt had previously indicated, but without giving any demonstration—and that the diverse types united under this denomination must be referred to other groups of osseous fishes. Resuming these investigations, I propose to show that one of the groups of the order Plectognathi, that of the *Balistes*, must take its place among the Acanthopterygians, in the vicinity of the *Acanthuri* and other fishes belonging to the small family of the Teuthyes.

The family of the Teuthyes, as established by Cuvier, presents, in the small number of genera which he combined under this denomination, two very different types of organization. The Sidjans or *Amphacanthi*, which Cuvier placed at the head of this family, differ so much from the other genera that M. Agassiz and subsequently

* $8\frac{1}{4}$–$8\frac{1}{2}$ inches (Rhenish meas.), according to Burmeister.

Dr. Günther have thought it necessary to separate them. This elimination having been made, the *Acanthuri* and the four or five allied genera which remain in the family Teuthyes have the closest affinities with the *Balistes*, as I shall now endeavour to prove.

In vertebrate animals it is the skeleton that furnishes the most correct indications as to the affinities and consequently the true characters of the natural groups. The uncertainty in which we still are with regard to the establishment of these groups among fishes will only be dissipated by the determination of their osteological types. The elements of such a work are still too completely wanting to allow of our attacking it as a whole; but we may prepare the way for it by partial investigations. Thus I now propose to demonstrate the very great analogy and the common characters of the skeletons of the *Acanthuri* and Balistidæ, especially the true *Balistes*, which are more nearly allied to the *Acanthuri* than the *Triacanthi*, *Monacanthi*, and *Alutera*.

In both groups the jaws are very small. The border of the upper jaw is formed solely by the intermaxillaries. The maxillaries, which are but very slightly developed, are firmly and immovably attached to the intermaxillaries. This character is the more important because it constitutes, according to Cuvier, the character of the order Plectognathi. Now the *Acanthuri* deserve to be called Plectognathi quite as much as the *Balistes*. The teeth, in both jaws, have the form of incisors.

The skull is very narrow. Its upper surface is much elongated and formed by two planes which meet at an obtuse angle above the orbit; whence it results that the true cranium descends obliquely behind the orbit to meet the vertebral column, instead of being placed in the same horizontal plane as this bony column. It also follows, from this oblique position of the cranial region, that the mastoid bone is placed very low. It nevertheless presents, in both groups, a large vertical apophysis in front of its articulation with the bones of the shoulder.

The upper occipital, or interparietal, advances between the principal frontals, and forms, at the summit of the head, a more or less elevated crest.

The ethmoid is much elongated; and consequently the anterior frontals and the palatines are at a great distance from each other, and do not become united to form bony nasal cavities.

The anterior sphenoid is produced in front of the orbit in the form of a vertical plate, which meets a vertical plate produced by the ethmoid, and forms with it a bony partition which separates the ethmoid from the palatine arch.

The vomer is very small, and destitute of teeth.

The palatines are also small, destitute of teeth, and movably articulated with the ethmoid and intermaxillary.

The different pieces of the temporal wing are not all soldered together, and leave empty spaces merely occupied by the membrane of the palate.

The opercular flap is formed only by the operculum and the sub-

operculum. The interoperculum is more or less concealed within the præoperculum; at least in its anterior part, or that which is joined to the jaw, and sometimes throughout its whole extent, it presents the form of a rod. The second case is that of the *Balistes*; the former that of the *Acanthuri*, in which it acquires the form of a very narrow plate only in its posterior part.

The hyoid bone is attached to the temporal wing at but little distance from the posterior angle of the lower jaw; it is consequently very small. The lateral branches, which bear the branchiostegal rays, have fewer pieces than in other fishes. The unpaired piece, or *tail of the hyoid*, is very large, and formed of two long branches uniting at a right angle.

The bones of the shoulder appear, in the part anterior to the pectoral fins, in the form of large plates, produced by at least the partial amalgamation of the three bony pieces which, according to Cuvier's nomenclature, form the *humerus*, *radius*, and *cubitus*. The coracoid is greatly developed. The pelvis is much elongated, and the two pieces which form it are more or less soldered together.

The vertebral column is formed by a small number of vertebræ (about 20 to 22). The dorsal vertebræ bear very long vertical neurapophyses and horizontal hæmapophyses starting from the middle of the vertebra and bearing very small ribs. The caudal vertebræ have the neurapophyses and hæmapophyses vertical and much elongated.

The differences between the skeletons of the *Acanthuri* and *Balistes* are but few and of slight importance.

The *Acanthuri* have nasal and suborbital bones, which are wanting in the *Balistes*; but these bones are very variable in fishes, and can only furnish secondary characters.

The dorsal fin is single in the *Acanthuri*, whilst in the *Balistes* the spinous and soft rays are separated to form two fins.

In the *Balistes* the præoperculum has its oblique shorter than its horizontal branch; the reverse is the case in the *Acanthuri*: consequently the branchial fissures and the opercular flaps are larger in the *Acanthuri* than in the *Balistes*.

In the *Acanthuri* the dorsal hæmapophyses bear, besides the ribs, some little styles which ascend in the interior of the muscles, as in the Clupeidæ.

We see therefore that, with the exception of a few differences, the osteological type of the *Acanthuri* is the same as that of the *Balistes*. I regret that I am unable to complete this investigation by the comparison of the other organs, which must undoubtedly present resemblances similar to those of the skeletons. I must add, however, that Valenciennes has already indicated the at least apparent similarity presented by the scaling of a species of *Acanthurus* (*A. scopas*) to that of certain Balistidæ of the genus *Monacanthus*—a resemblance which had even struck the Dutch of the East Indies, since they confound the Balistidæ and the *Acanthuri* under the same denomination, that of *Leervisch*, or "leather-fishes." — *Comptes Rendus*, June 17, 1872, pp. 1527–1530.